

Gills Onions Advanced Energy Recovery System

**Turning a Waste Liability
into a Renewable Resource**



Waste to Energy Using Fuel Cells Workshop
Washington, DC
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Gills Onions Background

- 3rd largest onion producer in the nation
- 100,000 square-foot processing facility in Oxnard, CA
- 800,000 lbs of onions processed every day
- Prepackaged diced, sliced, whole, pureed, and ring product line
- Process is operational 6 days a week



The Problem...

- **250,000 lbs/day waste onion hauled off site**
 - Hauled by tractor and wagon to local fields to incorporate into soil
 - Disrupted traffic
 - Trail of onion juice on roadway
 - Sulfur in onions led to acidic soils
- **\$400,000/year for off-site hauling**
- **Couldn't haul during heavy rain**
 - Decomposing onions stored on-site
- **Odors!!!**

**One-third
incoming onions
discarded as tail,
top, and peel!**





The Solution...

Advanced Energy Recovery System (AERS)

- 1** Grind Waste Onion to Extract Juice
Haul Remaining Onion Solids for Cattle Feed
- 2** Treat Juice Using an Upflow Anaerobic Sludge Blanket (UASB) Reactor
- 3** Recover Biogas from UASB
Remove Sulfur and Moisture for Cattle Feed
- 4** Convert Methane to Power
Fuel Cells
- 5** Supplement Process Facility Power Demand

Juice
Extraction

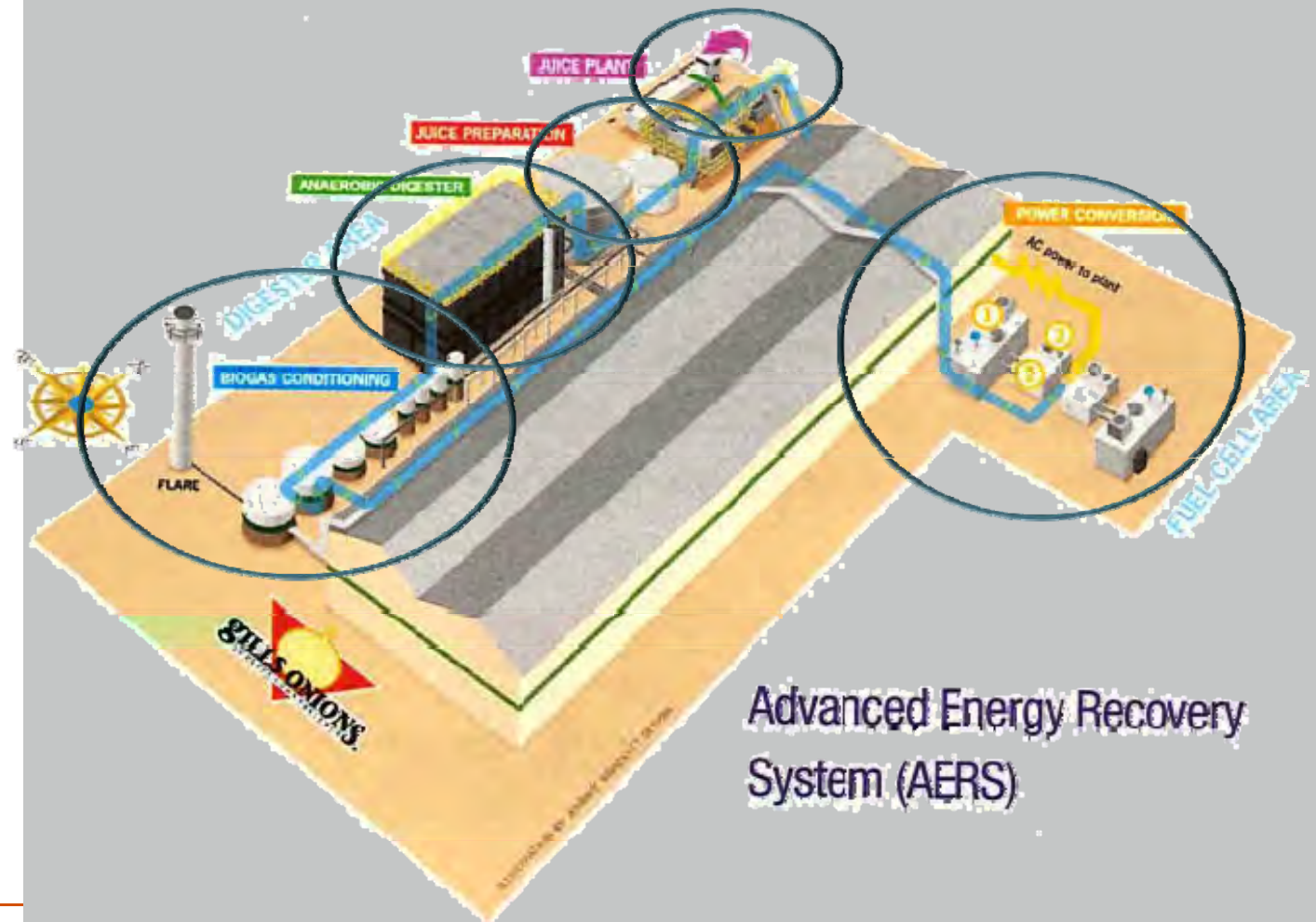
Juice
Preparation

BioReactor

Biogas
Preparation

Fuel Cells

Simplified Process Schematic



Advanced Energy Recovery
System (AERS)

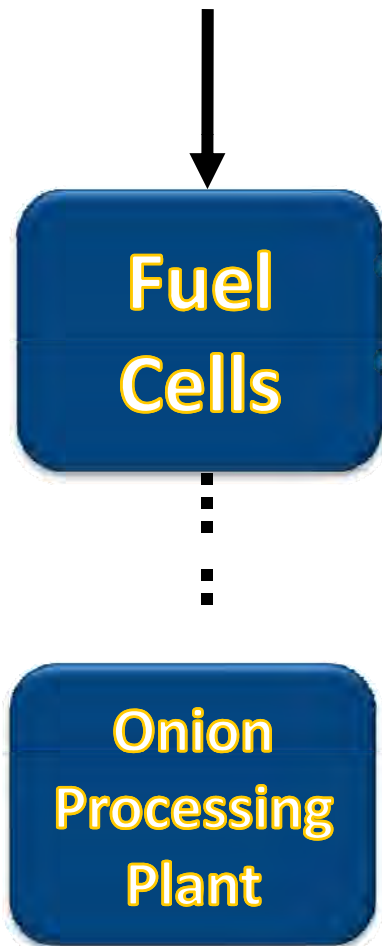
Fuel Cells

**Fuel
Cells**

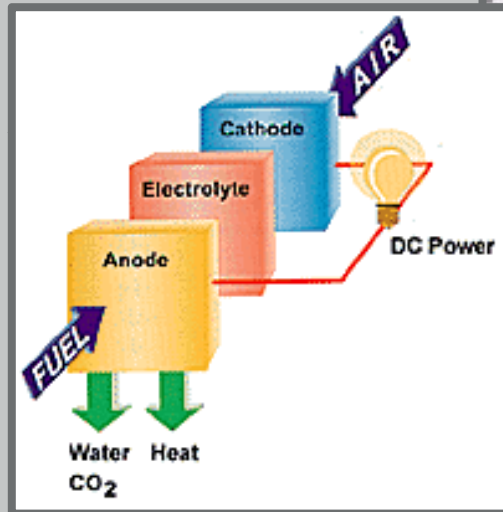
- 32 scfm of biogas per cell
- 15 psi
- Requires highly purified water (RO)



Energy

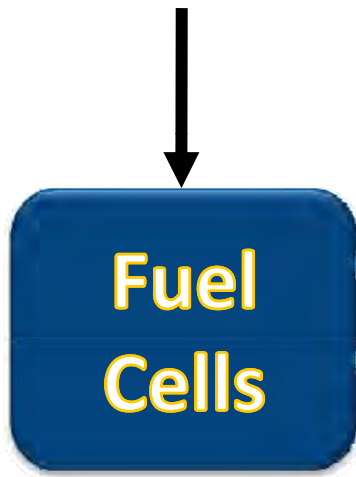


← NG
← RO Water



- Methane and steam converted into hydrogen-rich gas
- 47% electrical efficiency 480 V, 3 PH

Fuel Cells



← NG
← RO Water



- Two 300 kW output fuel cells
- Dual fuel NG and BG
- Up to 930 Btu/cf gas can be utilized
- Non-combustion, electrochemical technology

Environmental and Process Benefits

- Increased energy independence
- Eliminated a waste stream
- Decreased Gill's carbon footprint
- Reduced waste by 99%



Overall Project Costs

AERS Total Cost Installed	\$9.5 M
Sempra Energy Self Generation Incentive	(\$2.7 M)
Federal Fuel Cell Incentive (Tax Credit)	(\$2.0 M)
AERS Net Cost	\$4.8 M



Operational Savings & Return on Investment (ROI)

6-year ROI



Annual Savings from Energy and Hauling Cost	\$1,100,000
Annual AERS O&M Costs	(\$300,000)
Annual Savings	\$800,000

The Bottom Line @ Gills Onions

- **\$9.5 million facility will pay for itself in less than six years**
- **\$1.1 million in energy and hauling savings annually**
- **Cattle feed sales cover much of the cost of hauling feed to the Central Valley**
- **Fuel cells were \$3,400 per kW installed**
- **Use minimum 75% biogas on annual basis**



Industry Recognition - Grand Conceptor Award

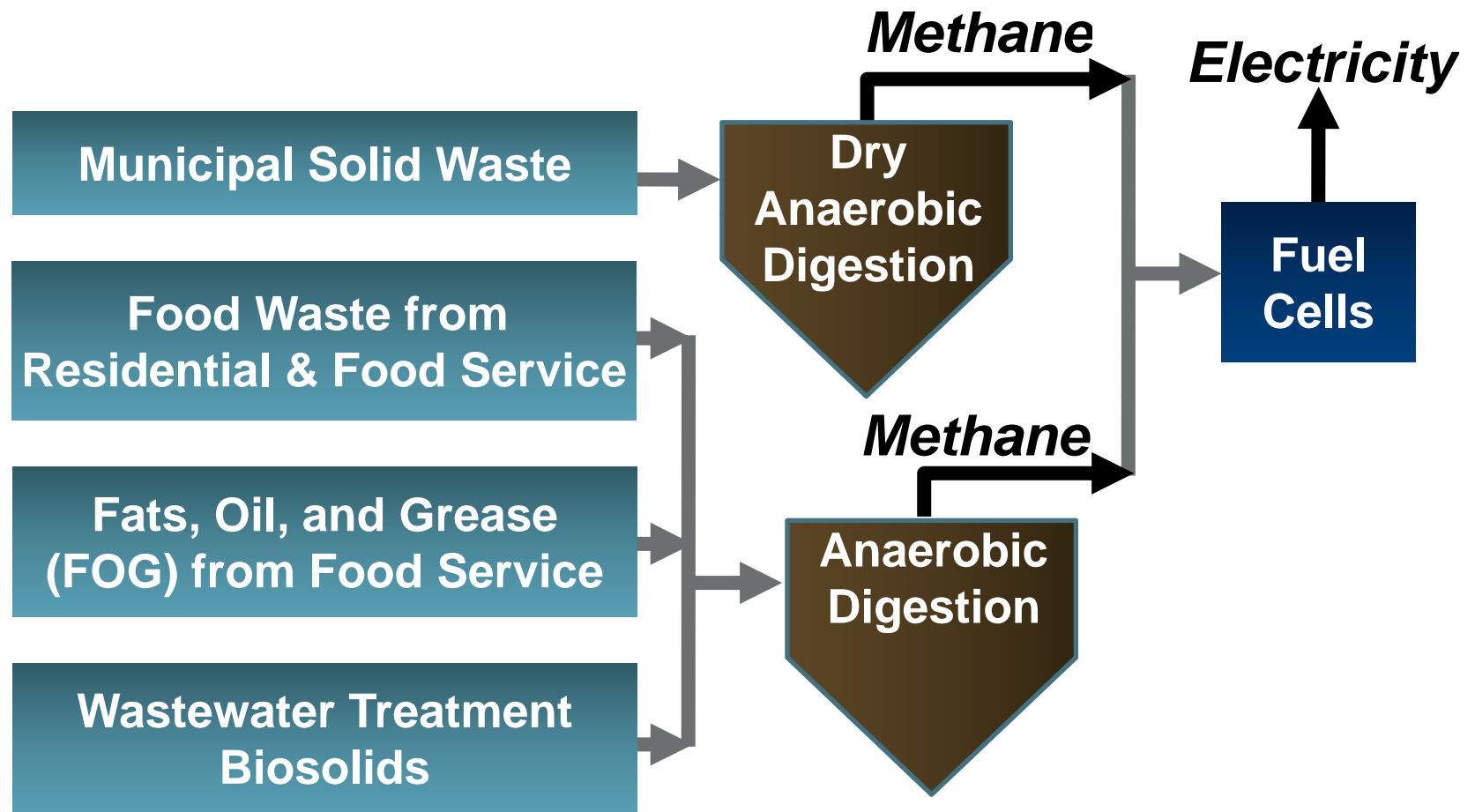
The highest honor from the American Council of Engineering Companies (ACEC)



**Why Did
Gills Onions
Win?**

**It's
Sustainable!**

What Does All This Mean for a Military Installation?



Think Holistically!

Your Take Away Points

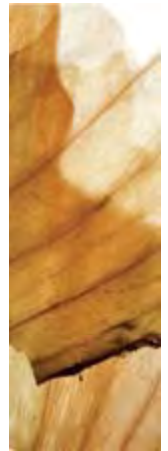


Think of your waste streams as a potential renewable resource

Sustainable projects can be done economically, and have social and environmental benefits

Think holistically - How can your waste stream be integrated for the most efficient processing

**Need More Details on
Gills Onions or
Resource Recovery
at Your Installation?**



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